CCR Initiative for RNA Biology

Steering Committee: Susan Gottesman, Stephen Hughes, Javed Khan, Stuart LeGrice, Tom Misteli, Jeffrey Strathern, Yun-xing Wang, Zhi-Ming Zheng, Joseph Ziegelbauer

Abstract

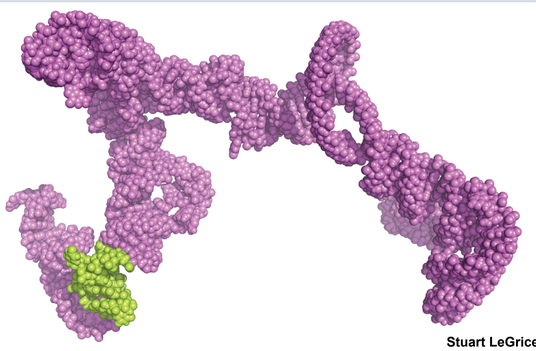
RNA biology has emerged as one of the most influential areas in modern biology and biomedicine. The discovery of numerous new classes of RNAs and their function in a wide spectrum of biological processes has revolutionized molecular biology and has profound implications for clinical sciences. Key areas of current research include the elucidation of RNA biogenesis and structure, the identification of functions for various classes of RNAs, establishing the role of RNA in disease, and the exploration of RNA-based- and RNA-targeted therapies. To promote these areas of research we have recently established the CCR Initiative for RNA Biology. The goal of the CCR Initiative for RNA Biology is to create an inter-disciplinary environment to facilitate the rapid exchange of information and expertise on the structure, function and biological roles of RNA and to foster synergistic interactions amongst CCR investigators. We anticipate that insights into RNA biology and the development of RNA-based tools will define novel targets and accelerate the implementation of therapeutic interventions in cancer. The CCR Initiative for RNA Biology is open to all CCR investigators with an interest in the biology of RNA.

Specific activities of the CCR Initiative for RNA Biology include:

- development of technology resources for the RNA community
- organization of scientific meetings to promote interactions within NCI, NIH and with the extramural community
- development and implementation of collaborative projects and new research directions
- training of the next generation of CCR RNA biologists

Research Areas

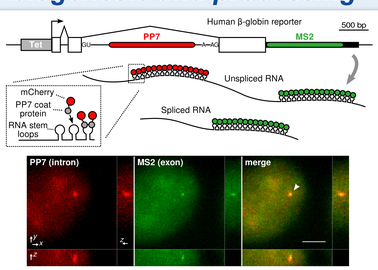
RNA structure



Stuart LeGrice

SHAPE-determined 3D model of 3' termini of Kaposi's sarcoma-associated herpesvirus Polyadenylated nuclear (PAN) RNA (ENE in green).

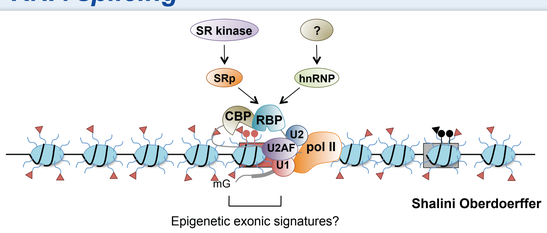
RNA biogenesis and processing



Dan Larson

Measuring transcription and splicing in living cells.

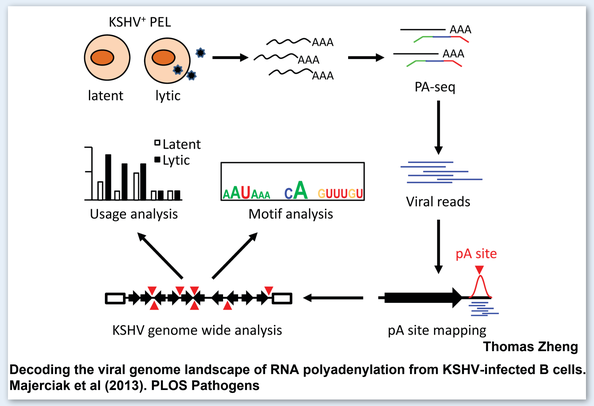
RNA splicing



Shalini Oberdoerffer

Measuring RNA and DNA-mediated mechanisms of splicing.

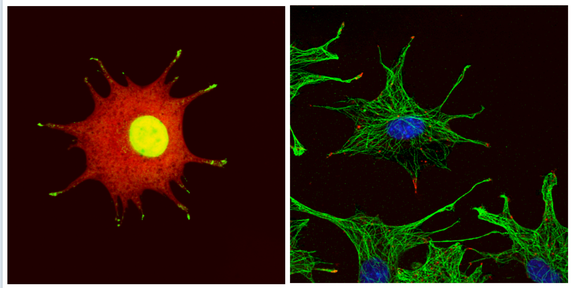
RNA biogenesis and processing



Thomas Zheng

Decoding the viral genome landscape of RNA polyadenylation from KSHV-infected B cells. Majerciak et al (2013). PLOS Pathogens

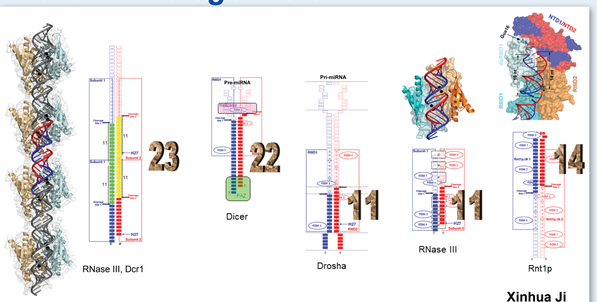
Functions of diverse classes of RNAs



Voula Mili

RNAs (green, left & red, right) localized at the tips of protrusions through the APC tumor-suppressor.

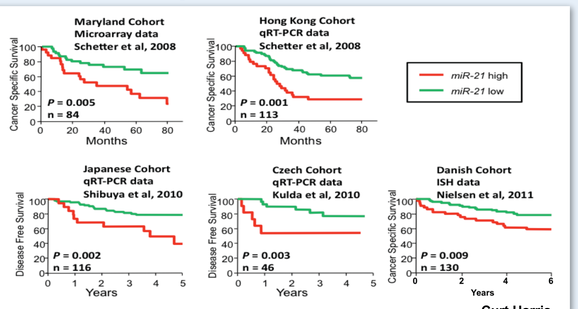
microRNA biogenesis



Xinhua Ji

RNA processing: How dicer dices.

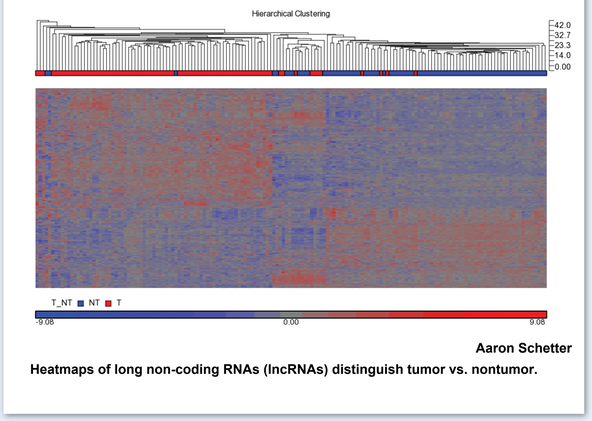
microRNA expression in cancer cohorts



Curt Harris

Kaplan-Meier plots show miRNA-21 expression correlates with prognosis in colon cancer.

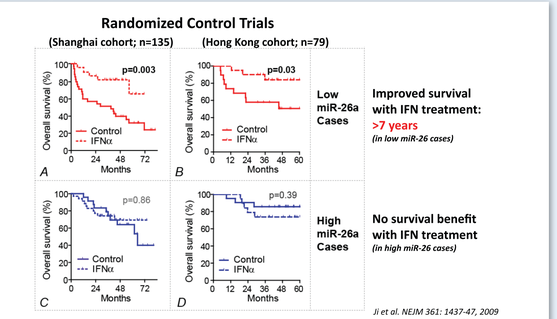
Roles of RNAs in disease



Aaron Schetter

Heatmaps of long non-coding RNAs (lncRNAs) distinguish tumor vs. nontumor.

microRNAs as biomarker-guided therapeutic tools

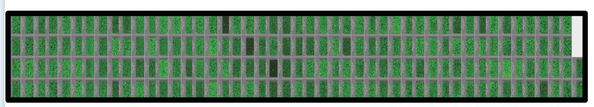


Ji et al. NEJM 361: 1437-47, 2009

Xin Wang

Discovery of microRNA as biomarker-guided therapeutic tools in liver cancer.

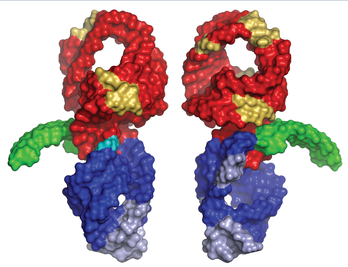
RNA-based functional genomic analysis



Natasha Caplen & Scott Martin

A genome-wide siRNA RNAi screen with 71,500 wells.

microRNA enhanced ribosomal frameshifting



Bruce Shapiro

A pseudoknot structure, additionally stabilized by a microRNA, in the human CCR5 mRNA promotes efficient -1 Programmed Ribosomal Frameshifting (PRF).

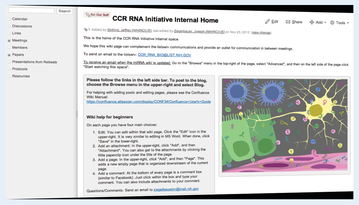
Activities

Scientific meetings to promote interactions

RNA Biology NCI Symposium March 11-12, 2015

Phillip Sharp, MIT
Jennifer Doudna, University of California-Berkeley
Ron Breaker, Yale University
Chris Burge, MIT
Howard Chang, Stanford University
Adrian Ferré-D'Amaré, NIH
Myriam Gorospe, NIH
Rachel Green, Johns Hopkins University
Shiv Grewal, NIH
Sakari Kauppinen, Santaris Denmark
Anastasia Khvovora, University of Massachusetts
Adrian Krainer, Cold Spring Harbor
Dan Larson, NIH
Lynne Maquat, University of Rochester
Joshua Mendell, UT Southwestern
Rachel Meyers, Alnylam Pharmaceuticals Inc.
John Rinn, Harvard University
Robert Singer, Albert Einstein College of Medicine
Frank Slack, Harvard University
Gisela Storz, NIH
Mike Summers, University Maryland-Baltimore County

Development of technology resources



Online tools for sharing unpublished protocols, reagents, and expertise http://goo.gl/eQtbqo or google "CCR RNA"

Development of collaborative projects and new research directions

Currently, 45 CCR laboratories are members of the group

Training of the next generation of CCR RNA biologists